


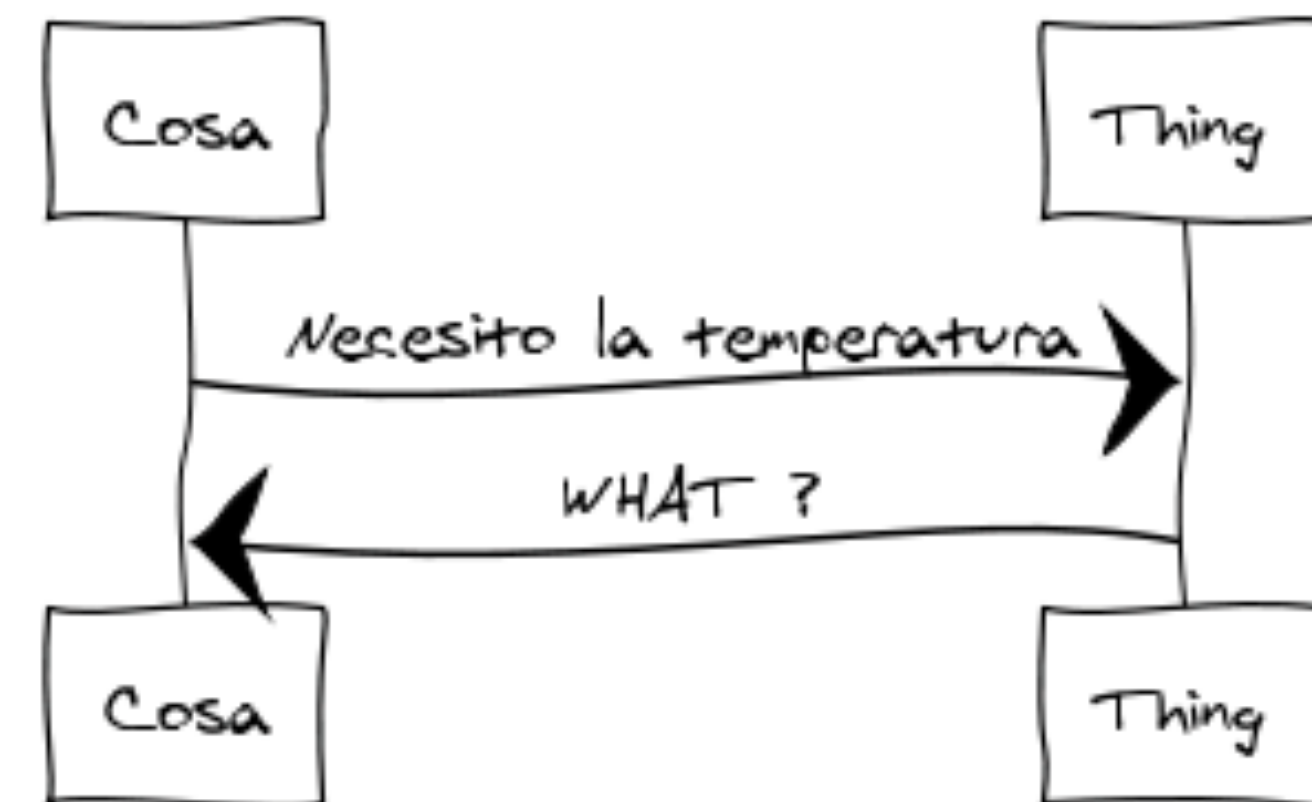
Semantic Interoperability for IoT

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IoT Research Days - Ericsson

 @jaim - [jaimejim.github.io](https://github.com/jaimejim)



IETF and IoT Work

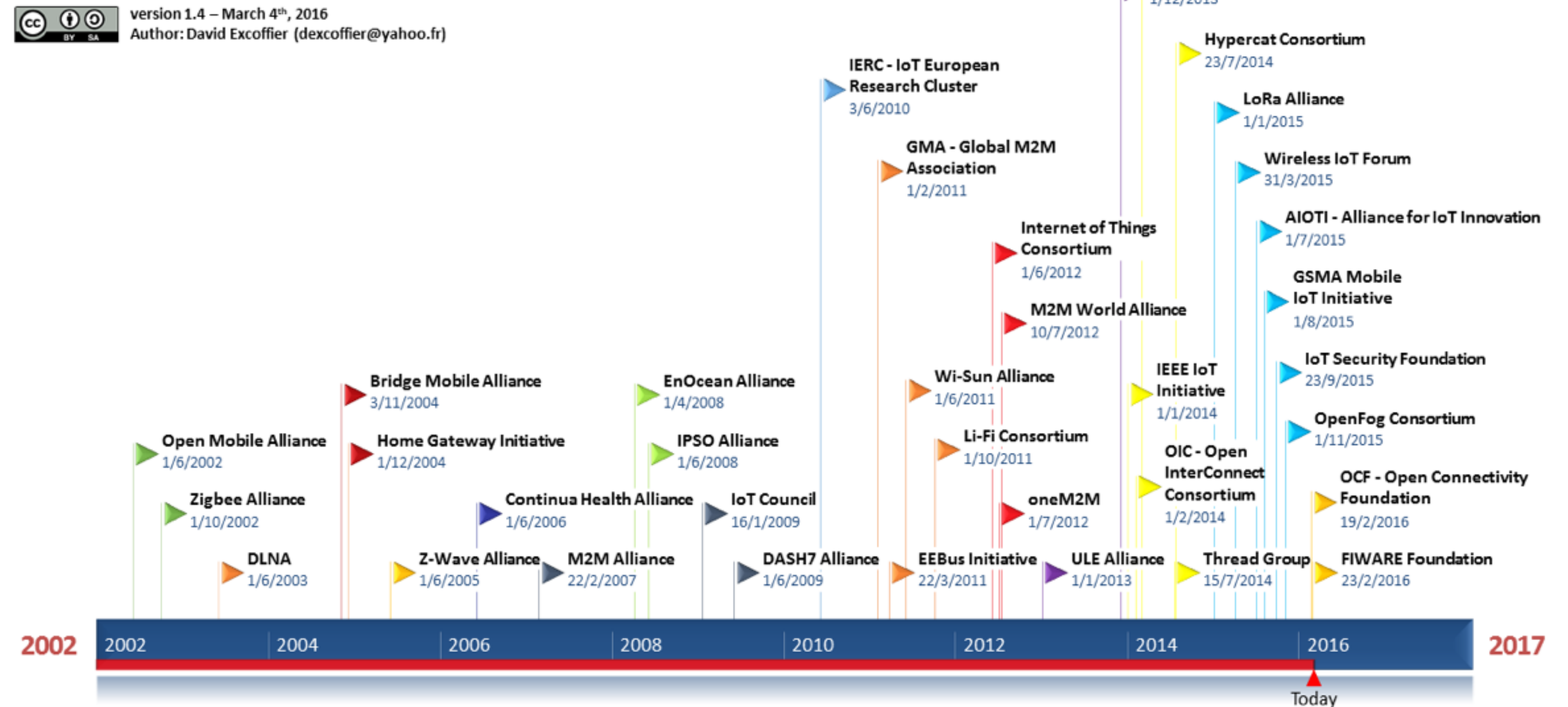
- IETF's role: Specify the underlying, fundamental Internet technologies
- “Permissionless innovation” - others can build on top - unlike “App Stores” or Telco services.

Run <IoT transfer protocol> over IP	Security for IoT (ACE, COSE)
Routing for lossy & low power networks	Thing-to-Thing communication (IRTF)
Web technology for IoT (CoRE)	Architectural oversight (IAB)

Consolidation is moving up the stack

- From closed, vertical solutions to open horizontal ones.
- Alignment on using Internet protocols. Already done on the network layer (IP, IPv6) and happening on application protocols (HTTP, CoAP, MQTT) but not there yet on the semantics.
- Many new consortia due to IoT hype.

Internet of Things Alliances & Consortia timeline



IAB - IOT Semantic Interoperability Workshop

March 2016

Why?

- Consumers and other users want systems where they can acquire components from different manufacturers.
- Ability to build larger systems out of components built by different companies and for different purposes will drive innovation.

Goals

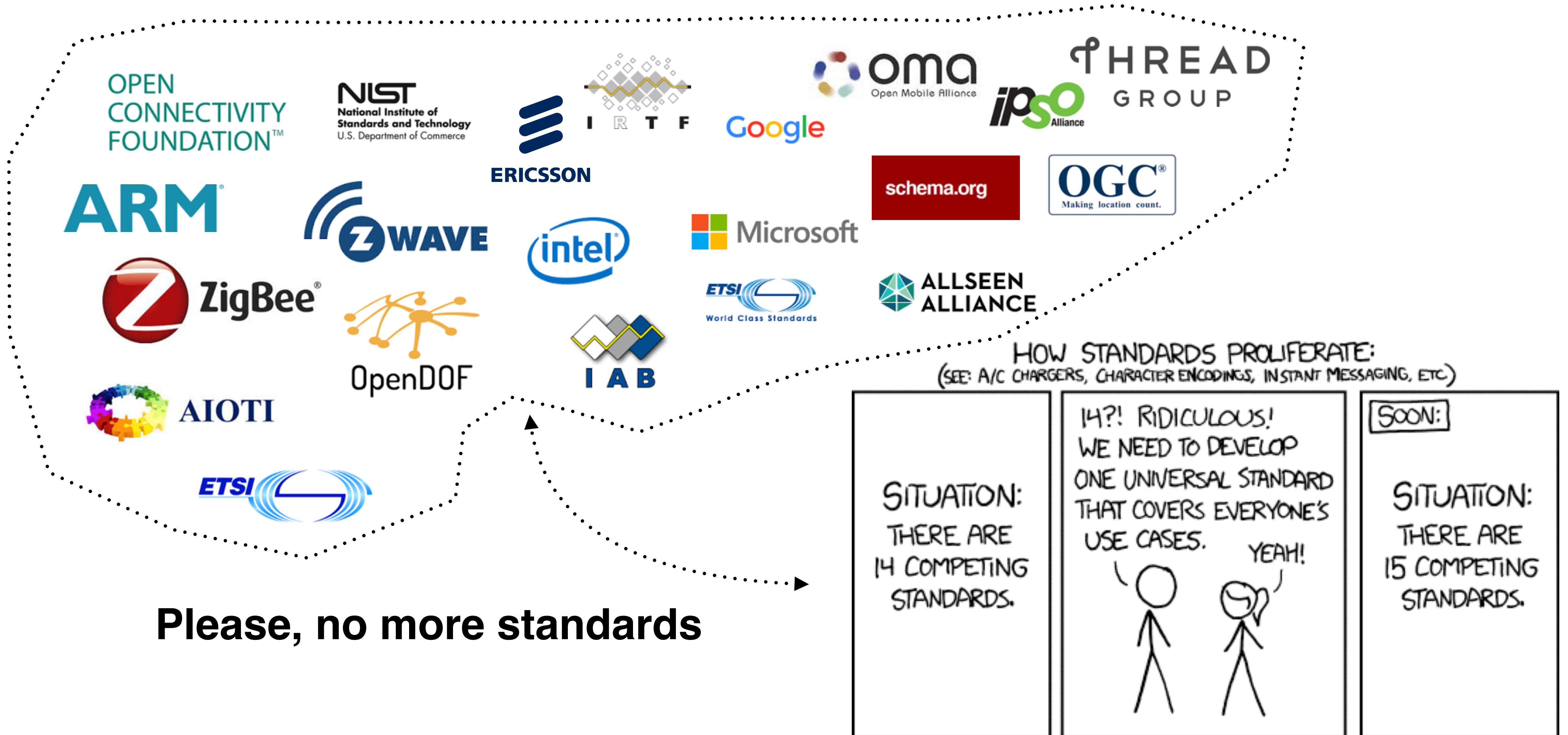
- Facilitate introductions between relevant organizations.
- Identify opportunities for cross-organization collaboration.
- Identify similarities between models: OMA/IPSO, W3CTD, YANG, Saref, ZDOs...)
- Have some lasting impact after one-time event is over.



Why IAB ?

- Internet tech and neutrality.
- Received 66 submissions (42 accepted): 17 standards organisations, vendors, operators, individuals and research organizations.

IAB - IOT Semantic Interoperability Workshop



IOTSI Workshop takeaways

Interaction Models

- REST vs PubSub vs RPC calls.
- REST facilitates IoT evolution.

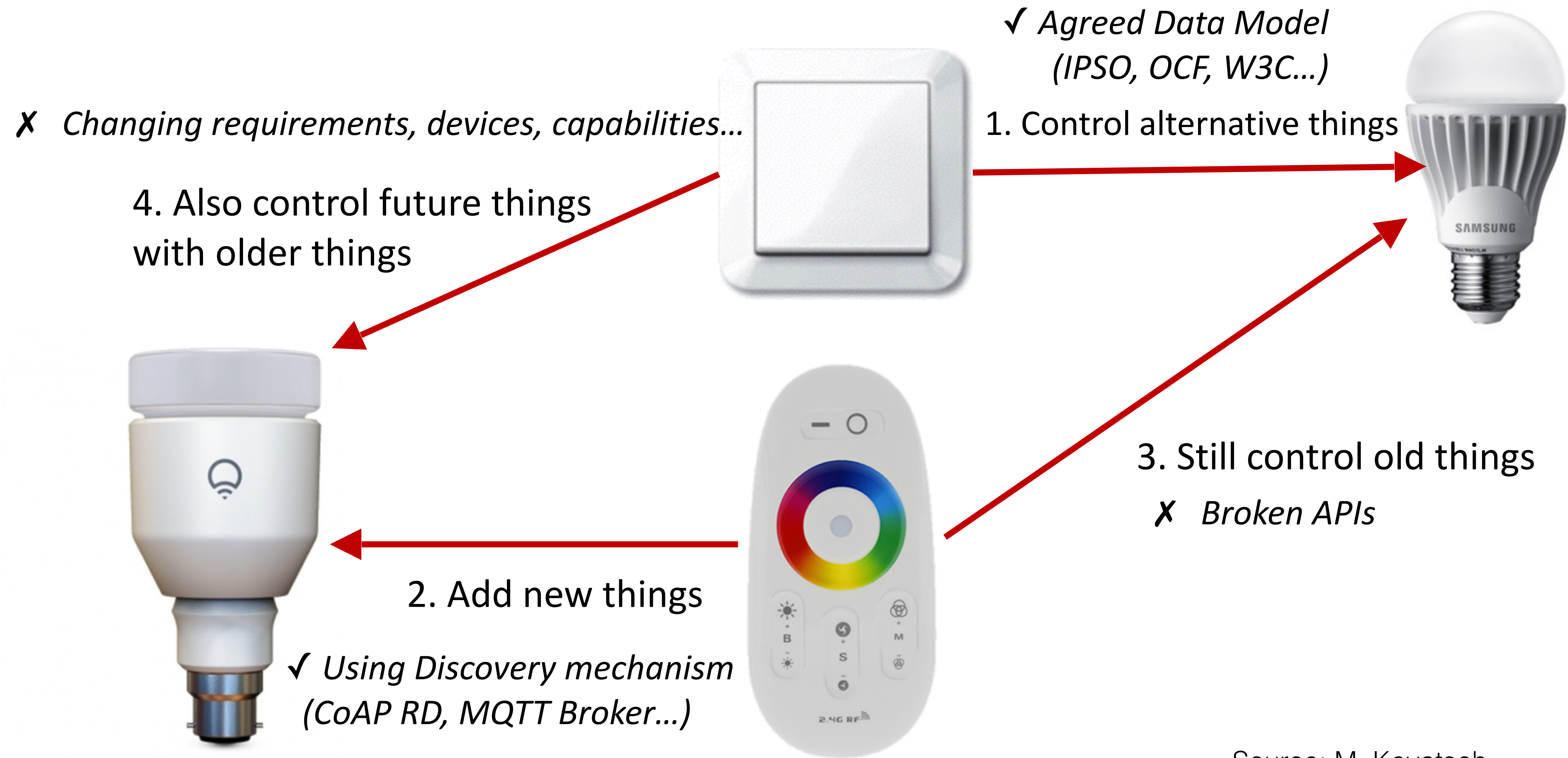
How and when to do translation

- Multiple Data Models will have to coexist (at least for a while).
- Lack of common terminology (IM, DM, etc).
- Translation Hubs: Runtime translation of data vs Translating DMs.
- Loss of information when translating data models.

How to deal with change

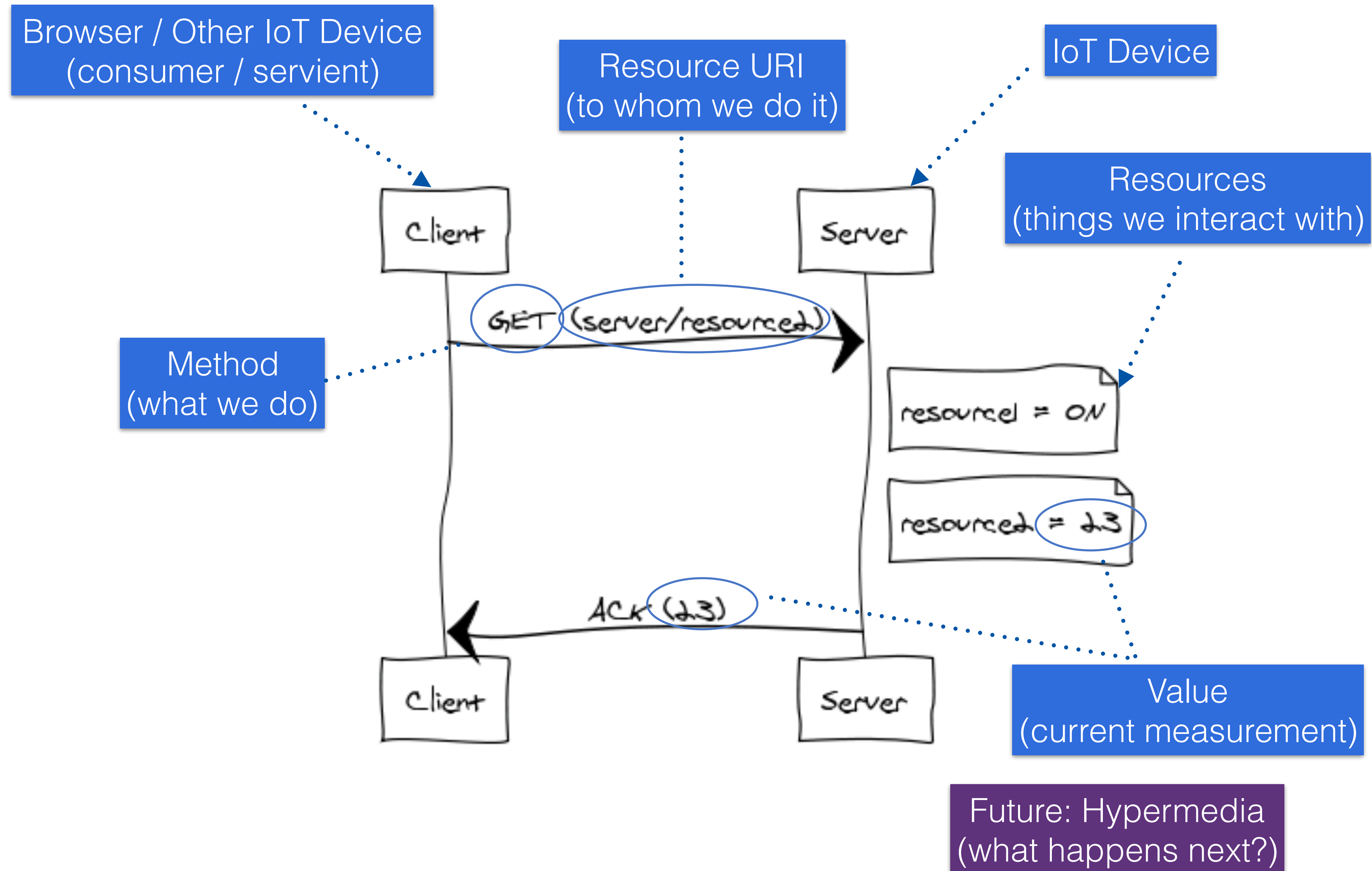
- Multiprotocol not an option for most constrained devices. Legacy is heavy.
- Need to build systems that last. Web approach.
- Hypermedia Applications vs “REST” static APIs vs Pushing Binaries.

Ability to deal with change



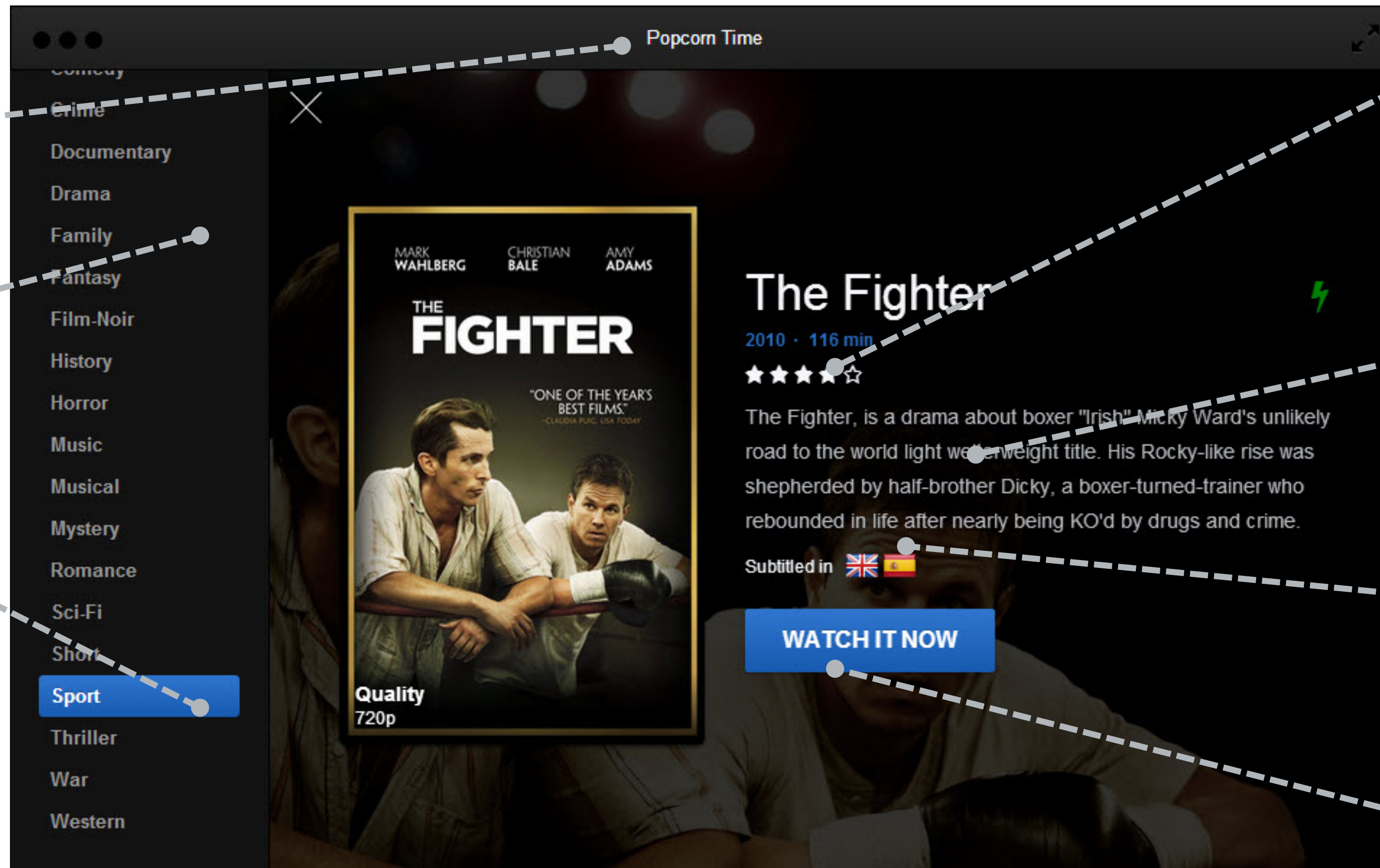
Source: M. Kovatsch

REST interaction components for IoT (roughly)



The power of mashups

Internal microservice APIs



Web Mashups through Open APIs...

Internal microservice APIs

City Hosts BETA
Host
Trips
Messages
Help
Jaime

Dates

Check in

Check out

1 guest

Room type

☒ Entire home

☐ Private room

☐ Shared room

Price range

€9

Average

€1,000+

Filters

300+ Rentals · Helsinki

Enter dates to see full pricing. Additional fees apply. Taxes may be added.

€44 ⚡

Cheap & Cozy in the heart of Helsinki

Entire home/apt · 2 guests · ★★★★★ · 128 reviews

€35 ⚡

Apartment in Center of Helsinki

Entire home/apt · 2 guests · ★★★★★ · 46 reviews

€62 ⚡

Urban studio in the Helsinki center

Entire home/apt · 3 guests · ★★★★★ · 18 reviews

€30

Studio for sharing in Kampi

Shared room · 1 guest · ★★★★★ · 63 reviews

+

-

☒ Search as I move the map

Google

Language and currency



tripadvisor®



... often break



31


Google Calendar Help Forum public

Actions

<

>

⚙



4


★ Can't sign in to Google calendar on my Samsung refrigerator

by Kris Spencer 11/20/14

I have a Samsung RF4289HARS refrigerator. The Google calendar app on it has been working perfectly since I purchased the refrigerator August 2012. However, with the latest changes in Google Calendar API, I can no longer sign in to my calendar. I receive a message stating "Please check your email in Google Calendar website". I can sign in fine on my home PC and have no problem seeing the calendar on my phone. Perhaps this is a Samsung issue, but I thought I would try here first. Has anyone else experienced this problem and what was the solution?

Categories: [Calendar not loading](#) [Report an issue](#)

Best Answer



4

Marc-André Beauchamp said:

12/26/14

Hi people,

For all new question about that, please make an obsolete version.

As it said in this support page <http://www.samsung.com/usa/support/solutions/faq/RF4289HARS/XAA>, please register your mail

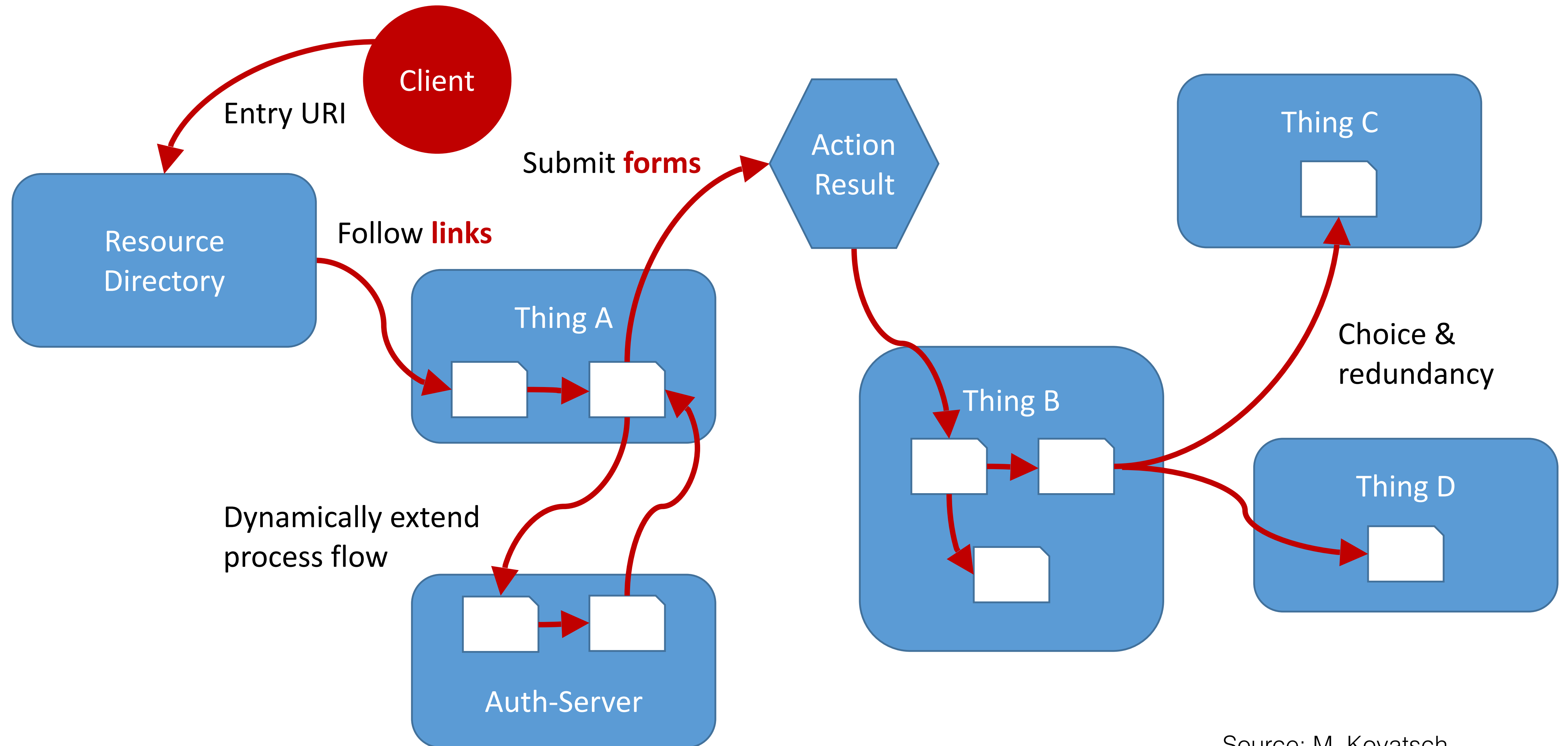
Email

Password

Please check your email in Google Calendar website

OK

Hypermedia-driven Applications (HATEOAS)



Source: M. Kovatsch

W3C Thing Description (TD) Example

```
{
  "@context": [
    "http://w3c.github.io/wot/w3c-wot-td-context.jsonld",
    { "actuator": "http://example.org/actuator#" }
  ],

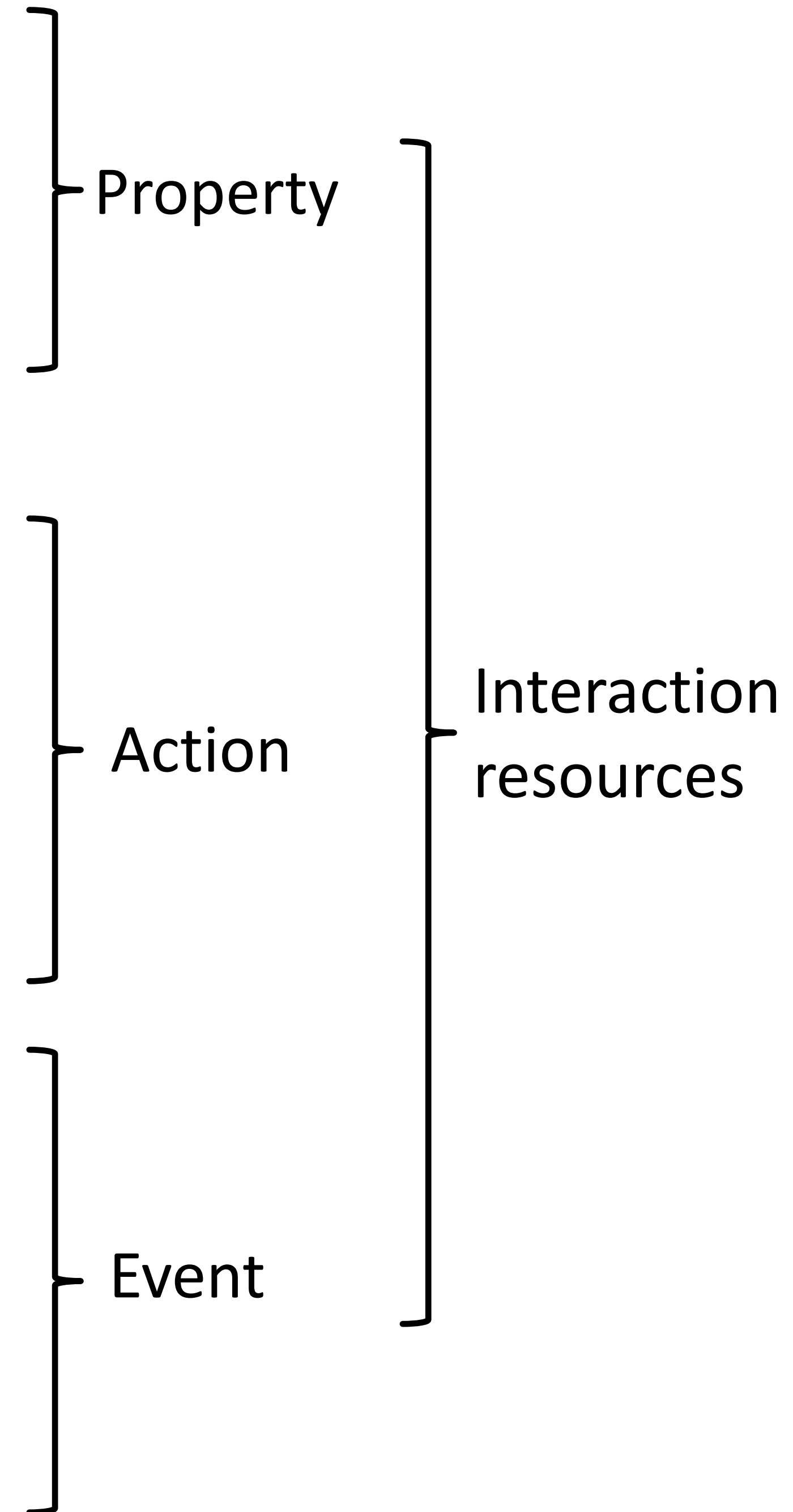
  "@type": "Thing",
  "name": "MyLEDThing",

  "uris": [
    "coap://myled.example.com:5683/",
    "http://mything.example.com:8080/myled/"
  ],

  "encodings": ["JSON", "EXI"],
  "security": {
    "cat": "token:jwt",
    "alg": "HS256",
    "as": "https://authority-issuing.example.org"
  },

  "properties": [
```

```
"properties": [
  {
    "@type": "actuator:onOffStatus",
    "name": "status",
    "valueType": { "type": "boolean" },
    "writable": true,
    "hrefs": [ "pwr", "status" ]
  }
],
"actions": [
  {
    "@type": "actuator:fadeIn",
    "name": "fadeIn",
    "inputData": {
      "valueType": { "type": "integer" },
      "actuator:unit": "actuator:ms"
    },
    "hrefs": [ "in", "led/in" ]
  },
],
"events": [
  {
    "@type": "actuator:alert",
    "name": "criticalCondition",
    "valueType": { "type": "string" },
    "hrefs": [ "ev", "alert" ]
  }
]
}
```



Thanks and Links

	IOTSI Workshop	https://www.iab.org/activities/workshops/iotsi/
Data Models {	IPSO	http://ipso-alliance.github.io/pub/
	LWM2M	https://github.com/OpenMobileAlliance/
	W3C Interest Group	https://www.w3.org/WoT/IG/
	OneIoT	http://www.oneiota.org/
REST {	REST	https://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm
	RESTful Web Apis	http://restfulwebapis.com
Hypermedia Application Languages {	CoRAL	https://tools.ietf.org/html/draft-hartke-t2trg-coral-00
	HSML	https://tools.ietf.org/html/draft-koster-t2trg-hsml-00
CoAP {	CoAP	https://tools.ietf.org/html/rfc7252
	CoRE Link-Format	https://tools.ietf.org/html/rfc6690
	CoRE RD	https://datatracker.ietf.org/doc/draft-ietf-core-resource-directory/